

-continued

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1.-38. (canceled)

39. A method for sequencing double-stranded target nucleic acid molecules, comprising:

- (a) ligating the double-stranded target nucleic acid molecules to double-stranded cyphers at both ends to form cypher-target nucleic acid complexes, wherein the double-stranded cyphers each comprise a random or partially random identifier sequence, and further wherein each target nucleic acid molecule is a DNA molecule comprising a target tag sequence that together with the double-stranded cyphers uniquely labels the double-stranded target nucleic acid molecule;
- (b) amplifying each strand of the cypher-target nucleic acid complexes to produce a plurality of cypher-target

amplification products from each of a first strand and a complementary second strand of the cypher-target nucleic acid complexes;

- (c) sequencing the cypher-target amplification products to produce a plurality of first-strand sequencing reads and a plurality of second-strand sequencing reads, wherein the plurality of first-strand sequencing reads and the plurality of second-strand sequencing reads each comprise an identifier sequence and a target tag sequence;
- (d) grouping the first-strand sequencing reads and second-strand sequencing reads based on sequence identity of: the identifier sequence, and the target tag sequence,